Docket No.: S9025.0026
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Christian J. Lee et al.

Application No.: 10/117,910 Confirmation No.: 6438

Filed: April 8, 2002 Art Unit: 1752

For: SELF DAMPENING INK COMPOSITIONS AND METHOD FOR LITHOGRAPHIC PRINTING USING SAME Examiner: H. V. Le

DECLARATION

RICHARD R. DURAND, JR. declares that

1) I am one of the Applicant's in the above identified application.

2) I am also one of the inventors in the Wasilewski et al. patent (U.S. Patent 5,372,635) which has been cited against this application.

3) I note the Examiner has stated on page 6 of an Office Action mailed January 27, 2006 that "soap is a conventionally known lithographic additive" and asserted that I and my co-inventors so stated at paragraph [0025] of the present application. That paragraph does refer to the use of "typical additives useful in lithographic inks" but there is no statement that "soap" is such a conventionally known additive. In fact, it is not.

4) It is well known that lithographic printing depends on the interaction between ink and water. The inks are oil based and based on the amount of water normally employed, a water-in-oil emulsion forms. The Printing Ink Manual, D.E. Bisset et al. (editors), Third Edition, Van Nostrand Reinhold Co. Ltd, 1984., points out

on pages 72-73 (copy attached) under the heading "Effect of Water and its Uptake" that "the formation of stable water-in ink emulsion is a most desirable feature of any litho ink..." and that "...if it (ink) continually takes up more water, a ink-in water emulsion would eventually form and result in tinting, scumming and piling". These three conditions (tinting, scumming and piling) are negative performance indicators associated with the wrong type of emulsion behavior. The "Chemistry of Lithography", Paul Hartsuch, Lithographic Technical Foundation, 1961 (page 92, copy attached) points out that a lithographic plate maker never cleans his metal plates with a solution of soap. The soap sensitizes the non-image area to receive ink which, of course, is not desirable. Accordingly, soap is not added to a lithographic ink.

5) "Physical Chemistry of Surfaces", Arthur W. Adamson, John Wiley and Sons, 1990. page 538 (copy attached) indicates that HLB values of 0-7 are suitable for water-in-oil applications (of which lithographic inks are an example) while materials having an HLB greater than 10 are suitable for oil-in-water applications. Accordingly, the use of any surfactant having an HLB of about 8 or greater, as in the present invention, is counterintuitive.

6) The printing ink composition of our Wasilewski patent requires the use of a soap of a tall oil fatty acid in order to be self-dampening. The fact that this soap could be used in a lithographic ink was highly surprising. The tall oil fatty acid was usable because it has an effect on the basic and novel characteristics of the lithographic ink. This, and the effect of alternate materials, was demonstrated as follows.

7) A commercially available black ink from U.S. Ink (U.S. 05-3586 Batch #509034, which contains 65.3% mineral oil) was combined with one or more of a 30% tall oil fatty acid neutralized by potassium hydroxide in glycerol, Glucopon 425 N, a non-ionic polyglucoside from Cognis which has an HLB of 13.1, Igepal CA720, a non-ionic alkyl phenol ethoxylate with HLB of 14.2 from Rhodia, and glycerol (beyond that in the U.S. Ink material) as shown in the following table. The resulting mineral oil amount was

about 42% in all inks. A Wasilewski formulation was used as the "Standard".

Component	Standard	Ink A	Ink B	Ink C	Ink D
Black Ink US05-3586 Batch # 509034	95.0%	100%	92.5%	96%	97%
Tall Oil Fatty Acid Soap Solution	4.5 %	-	4.5%	-	
Glucopon 425 N	-	-	1.0%	2.0%	0.5%
Igepal CA 720	0.5%	-	-	-	0.5%
Glycerol	-	-	2.0%	2.0%	2.0%

The inks were emulsified with 35% water as they would be in lithographic printing, and the stability of the emulsion, and the ability of the emulsion to wet or stick to glass were observed. In addition, the ability of the ink to satisfactorily lithographically print was investigated. The results are shown in the following table.

35% Emulsions made with:	Glass Wetting	Printing on Litho Plate	Water stability
Standard	Slips on Glass	Clean Printing –Image differentiation	Overnight
Ink A	Sticks to Glass	Gross water separation –Uneven printing	Unstable immediately
Ink B	Sticks to Glass	Water Separation-Uneven printing	Unstable
Ink C	Slips on Glass	Clean Printing –Image differentiation	Overnight
Ink D	Sticks to Glass	Clean Printing –Image differentiation	Few Hours

Ink A does not contain a tall oil fatty acid and was unsatisfactory. The Standard containing the tall oil fatty acid was good. The addition of the tall oil fatty acid to the HLB 13.1 non-ionic surfactant composition (Ink B) rendered the composition unacceptable. Ink C, which contains the Glucopon 425 N alone but no tall oil fatty acid soap was an acceptable self-dampening single-fluid and similar to the Standard of the

Wasilewski patent. Ink D, which contains the Glucopon 425 N and Igepal CA 720, was a self-dampening single-fluid albeit not a preferred composition.

8) The foregoing experimental results demonstrate that the tall oil fatty acid effects the basic and novel characteristics of the lithographic ink, sometimes in a positive way and other times in a negative way.

9) Upon information and belief, the ethoxylated acetylenic diol surfactant used in Example 1 of Krishnan U.S. patent number 5,725,646 had an HLB of less than about 8.

10) I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: June 22, 2006

Richard R. Durand Jr.

Richard R. Durand, Jr.

coverage, the proposed
lied with each individual

f a litho ink as it leaves
igh the roller chain, will
the time it reaches the
, it will be about 2 μm.
particularly with large
fairly thick films of ink
en the lack of smoothness
t favour minimum film-
n posters can even be
ess greater than that of
rect litho on most other
milarity to letterpress in
ess applied. The ink
proportion of coloured
lso be similar to letter-

y, the film transferred
ted on the blanket. The
ipression so that part of
ate and a residual film is
tting of very thick films
f adhesive and cohesive
m out into long or short
omly to give a fifty-fifty
two surfaces. As the
, the adhesive forces
osing surfaces become
icing the amount of ink

r retained by the ink
rating the nature of film
of a thin film sand-
set blanket and a sub-
a second before the film
of printing, leads to a
and possibilities. The
ly, a relatively viscous
inely divided dispersed
rticles. The dispersed
ected to high shear and
tances preventing floc-
ticles or coalescence of
ober blanket will reject
its surface and the sub-

plest of the possibilities, lead to a
ink richer in pigment, particula
adjacent to absorbent substrate, wi
of composition leading to similar
original ink at the blanket bou
splitting involves less the separatio
tinuous phase and more the separa
of relatively discrete particles of
water. Cohesion and tack will va
to layer. The picture is also affected
pressure and compressibility of
speed plays an even greater rol
unusual to find, therefore, that
to 4 μm thickness on the blanke
ference to an absorbent substrate
65–80 per cent. Further conside
film splitting phenomenon will le
clusion that failure to transfer mo
cent encourages piling.

Ink strength in lithographic in
printing demands coloured pigmen
tion similar to that in letterpress in
offset, dependent on substrate,
per cent greater concentration to
comparable density. If the paper
covered, it is very difficult when
solid dry print to say whether
been achieved by printing with
strong ink or a thick film of a

Effect of water and

Lithographic printing depends o
relationship between printing in
the first instance, the system can
water-in-ink emulsion and, in
instance, an ink-in-water emul
formed.

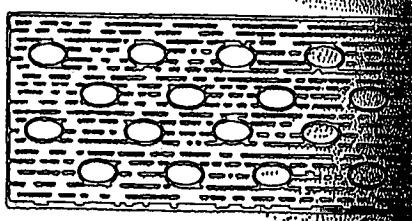
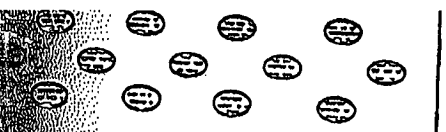


Fig. 3.11. The water-in-ink



3.12 The ink-in-water emulsion.

mation of the stable water-in-ink
most desirable feature of any litho
was completely water resistant, its
print faithfully from an offset plate
mited and image sharpening would
ake place.
ortant that the amount of dispersed
by a litho ink remains constant
continually takes more and more
k-in-water emulsion would even-
nd result in tinting, scumming and
od ink may contain between 10 and
of emulsified water. Under these
it must continue to distribute pro-
e ink rollers and transfer well from
ubstrate.

Rheology

has always been very much a craft
as such, litho inks used to be
a consistency greater than was
e printer would then modify the
ng on the type of job, solid or half-
ent years, litho inks have been sup-
eady, but although an ink can
ade softer by reduction the reverse
uch more difficult.
ical properties of an ink, which can
d and correlated with press be-
plastic viscosity, yield value and
se features, however, are modified
nt and condition of water taken up
hen, and if, equilibrium conditions
Rheological features of the litho
e to or at the moment of impression
received the attention and meas-
perhaps deserve.
mulsification tests have been de-
e most used one involves bringing

quent evaluation of the take-up of water and its effects give some guide to an ink's press performance.

General considerations and guiding principles in formulation

The passage of a litho ink through an offset press places a number of requirements upon the formulation of the ink. These requirements are often conflicting: for example, good roller stability, and fast setting and drying.

Feeding and control

Film weight and duct settings are always a lively topic for discussion between the printer and the inkmaker. Nowadays, accurate assessments of ink mileage form an integral part of any quality control programme. The offset press ink duct must deliver a constant charge of ink to the distribution rollers on which the ink film is eventually 'rolled' to a consistently thin film for application to the planographic plate. The charge of ink to the rollers must be precise and represent the amount of ink taken off the roller at each impression. If excess ink is delivered, then the ink could pile in the roller chain; and if insufficient ink is delivered, then the prints would be 'starved'.

In its simplest form, the ink duct consists of a steel blade pressed against a revolving steel roller by a series of adjustable keys. The ink is usually taken from the steel roller and transferred to the roller chain by a vibrator roller. It is important at this stage for the ink to flow in the duct; otherwise 'hanging back' and ink starvation can occur. Poor ink flow in the duct is associated with the over pigmentation of poor-wetting ink vehicles. Ink agitators can be used to alleviate this problem.

At similar duct settings, inks of different consistencies will generally give different delivery rates from the duct. The mechanical setting of the duct does not necessarily give an indication of an ink's mileage.

Actual fats occur in nature, and are produced by plants or animals. Olive oil, palm oil, linseed oil, cottonseed oil, lard, butter, and beef tallow are common examples of fats or oils. Any one of these fats is a mixture of several different kinds of "fat" molecules. The only thing that makes one fat different from another fat is in the percentage and kind of the fat moleucles in that fat. One fat may be fairly rich in a particular fat molecule while another fat contains only a small percentage of that kind of fat molecule.

Making Soap from a Fat. When a fat reacts with an alkali such as NaOH, or KOH, a *soap* is formed, and the other product is glycerine. A soap is merely a mixture of the sodium or potassium salts of the fatty acids, the radicals of which were present in the particular fat which was used. If the letter "R" is used to represent the radicals $-C_{17}H_{35}$, $-C_{15}H_{31}$, $-C_{17}H_{33}$, $-C_{17}H_{31}$, and $-C_{17}H_{29}$ then a general equation can be written for the preparation of a soap. It is:

$$\underset{\text{"fat"}}{(R{-}COO)_3C_3H_5} + 3NaOH = 3\underset{\text{"soap"}}{R{-}COONa} + \underset{\text{glycerine}}{C_3H_5(OH)_3}$$

This reaction shows why glycerine is produced and sold by plants that make and sell soap.

Soap and Litho Plates. It is now possible to explain why a platemaker never cleans his metal plates with a solution of soap. Suppose he does wash his plate with a soap solution. Naturally he would wash it off afterwards, but a thin film of the soap may remain on the surface of the plate. Then if he treats the plate with an acid, such as HCl, the following reaction occurs:

$$\underset{\text{"soap"}}{R{-}COONa} + HCl = \underset{\substack{\text{free}\\ \text{fatty acid}}}{R{-}COOH} + NaCl$$

The products of the reaction are the free fatty acid and NaCl. The free fatty acid is "greasy." That is, it holds onto the surface of the metal by adsorption (see page 109 for more about adsorption). The $-COOH$ groups are apparently good adsorbing groups. The molecules turn with their $-COOH$ groups oriented toward the surface of the metal, and with the long "R" group sticking out into the air. The "R" group is organic in nature, consisting of C and H atoms. It is "ink receptive" or "greasy," and thus the whole plate is more or less "greasy." This shows why plates are not washed with a soap solution.

Carbohydrates. Carbohydrates are compounds of carbon, hydrogen, and oxygen, in which there are usually twice as many hydrogen atoms as oxygen atoms. There are three kinds of carbohydrates—sugars, starches, and cellulose.

Sugars. Sugars are not used much in lithography. Dextrose (glucose) and fructose (fruit sugar) have a formula $C_6H_{12}O_6$. Sucrose (common cane or beet sugar), lactose (milk sugar) and maltose have the formula $C_{12}H_{22}O_{11}$.

Starches. The starches have much higher molecular weights. Starches have a formula $(C_6H_{10}O_5)_n$ where "n" is about 250 to several thousand. Starches do not form a true solution with water, but form a milky colored, colloidal solution. Most dry offset sprays are special grades of starch.

What is a Colloidal Solution? A colloidal solution is somewhat different than a true solution. The difference is mostly in the diameter of the particles that are mixed with the solvent. In a true solution, the dissolved particles are usually single molecules, or ions. A true solution may be colored, or colorless, but it is not milky or cloudy in appearance. The diameter of particles in a true solution is 1.0×10^{-7} cm., or smaller.

If the particles mixed with the solvent have a range of diameters between 1.0×10^{-7} and 100×10^{-7} cm., then the mixture is called a colloidal solution. Such solutions are more or less milky or cloudy in appearance. Water solutions of starch, albumin, gum arabic, and cellulose gum are all colloidal solutions.

Suspensions and Emulsions. If the particles mixed with the solvent have diameters greater than 100×10^{-7} cm., then the mixture is called a *suspension*, or an *emulsion*. If the particles are solid, the mixture is usually called a suspension, while if the particles are liquid, the mixture is usually called an emulsion. Solid pigment particles form a suspension in an ink or paint, while liquid fountain solution forms an emulsion with the ink. Enough of this diversion. Let's get back to starches again.

Dextrins. When starches are heated in the presence of a small amount of HCl, which acts as a catalyst (see page 45), the long starch molecules are broken down into somewhat shorter molecules to produce *dextrins*. Dextrins are more soluble in water, and are used as adhesives on postage stamps and envelopes. During World War II the Germans were forced to use dextrins as a substitute for gum arabic. However, they are rather poor desensitizing agents.

Cellulose. Cellulose also has a formula $(C_6H_{10}O_5)_n$, but the atoms are arranged differently, and cellulose has even a higher molecular weight than starches. Cellulose is completely insoluble in water, though cellulose fibers swell in the presence of water. Cellulose is of interest to the lithographer since it is the base of all paper, on which most lithographic printing is done (with due

caused to take place involve introducing a condition such that the opposite type of emulsion would normally be the stable one. First, an emulsion would *have* to invert if ϕ exceeded 0.74, if the inner phase consisted of uniform rigid spheres; as noted in Section XIV-3A, this value of ϕ represents the point of close packing. Actual emulsion droplets are deformable, of course, and not monodisperse. Continued addition of inner phase may result in inversion, but the effect is not assured and certainly will not be controlled by the theoretical ϕ value of 0.74. As an extreme of exceeding this number, Sebba (49) has produced "biliquid foams," that is, emulsions with polyhedral cells of inner liquid and thin-film outer liquid looking much like a foam.

Second, it will be recalled that soaps with monovalent cations tend to stabilize O/W-type emulsions, whereas those with polyvalent cations stabilize W/O emulsions. Thus, the addition of, say, a calcium salt to an O/W emulsion stabilized by a sodium soap can result in inversion. Change of temperature may also result in inversion. Both aspects are discussed further in Section XIV-5.

The general impression is that where the inner phase is not too dilute, the emulsion type is determined by some dynamic balance of various factors and responds fairly readily to a change in conditions. Clowes (16a), in particular, made some striking observations on the appearance of emulsions undergoing inversion. On the addition of a calcium salt to a sodium soap-stabilized O/W emulsion, he comments that the oil globules first distorted, then elongated as the critical point was approached, with very marked "Brownian" movement. The elongated sections of aqueous phase then necked in to give a W/O system. The agitated appearance and marked streaming of the two phases at the critical inversion point was probably due to local concentration fluctuations as the added calcium salt mixed with the system with resulting Marangoni effects (Section IV-2D).

Deemulsification, or the breaking of an emulsion, can be accomplished by the judicious use of one of the preceding methods of emulsion inversion or by methods that accelerate the coalescence rate of droplets. Also, a *phase change* in one of the two liquid phases may be helpful; thus emulsions may be broken by heating to near the boiling point of the inner phase or by freezing and then rewarming. Absorption chromatography has been used as a means of removing the emulsifying agent and thus breaking the emulsion (50).

5. The Hydrophile–Lipophile Balance

There is a very large technology that makes use of emulsions, and somewhat as in flotation, empirical observation still leads theory, in this case with respect to the prediction of the type and stability of emulsion that a given set of constituents will produce. A very useful numerical rating scheme, however, was introduced by Griffin (51) and is known as the *hydrophile–*

TABLE XIV-1
The HLB Scale

Surfactant Solubility Behavior in Water	HLB Number		Application
No dispersibility in water	0		
	2		
	4		W/O emulsifier
Poor dispersibility	6		
Milky dispersion; unstable	8		
Milky dispersion; stable	10		Wetting agent
Translucent to clear solution	12		
	14	Detergent	
Clear solution	16		O/W emulsifier
	18	Solubilizer	

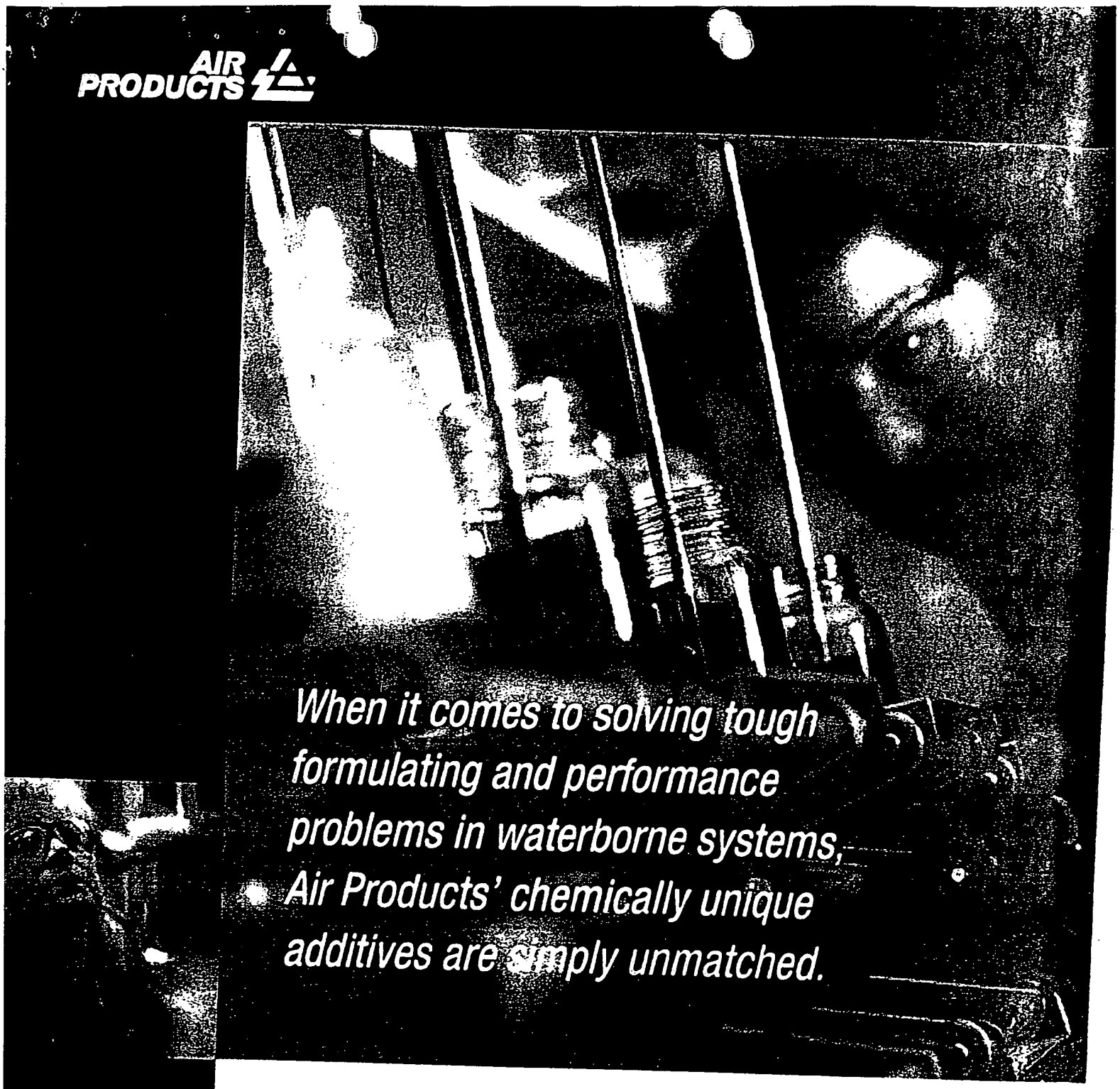
lipophile balance, or HLB, number. First, numbers are assigned on a one-dimensional scale of surfactant action, as given in Table XIV-1; note the correlation with Bancroft's rule (Section XIV-3A). Each surfactant is then rated according to this scale (see Refs. 1 and 3 for detailed listings and Ref. 52 for a bibliography). It is assumed that surfactant mixtures can be assigned an HLB number on a weight-prorated basis.

The central assumption of the HLB system can be illustrated as follows. Suppose a certain O/W emulsion is desired. The oil and water phases are emulsified using, say, various proportions of Span 65 (sorbitol tristearate, HLB 2.1) and Tween 60 (polyoxyethylene sorbitan monostearate, HLB 14.9). It is found that the optimum emulsion (smallest droplets) is obtained with 80% Tween 60 and 20% Span, average HLB = 12.3. The assumption is then that with any other mixture of surfactants, optimum performance for the particular system will again be at HLB = 12.3 as, for example, if mixtures of Span 85 (sorbitan trioleate, HLB = 1.8) and Tween 20 (polyoxyethylene sorbitan monolaurate, HLB = 16.7) were used in the required proportion, or 70% Tween 20. The *absolute* performance of the two mixtures might differ, but each should be at *its optimum*. The next step, in practice, would be to make up a number of such optimum mixtures and find the one whose absolute performance was best.

Davies (53) (see also Ref. 54) carried the additivity principle further by developing a list of HLB functional group numbers, given in Table XIV-2. The empirical HLB number for a given surfactant is computed by adding 7 to the algebraic sum of the group numbers. Thus the calculated HLB number for cetyl alcohol, $C_{16}H_{33}OH$, would be $7 + 1.9 + 16(-0.475) = 1.3$.

A diagram showing the general progression of structures with HLB number is shown in Fig. XIV-10 (55, 56). While the designations W_m and O_m refer to micelles in aqueous and "oil" solution, the progression can also be that

AIR PRODUCTS



Surfynol®, Dynol™, and EnviroGem® Additives

reference guide

Surfynol Surfactants

Surfynol 104 Surfactant
Surfynol 104A Surfactant
Surfynol 104BC Surfactant
Surfynol 104DPM Surfactant
Surfynol 104E Surfactant
Surfynol 104H Surfactant
Surfynol 104PA Surfactant
Surfynol 104PG-50 Surfactant
Surfynol 104S Surfactant
Surfynol 2502 Surfactant
Surfynol 420 Surfactant
Surfynol 440 Surfactant
Surfynol 465 Surfactant
Surfynol 485 Surfactant
Surfynol 485W Surfactant
Surfynol 502 Surfactant
Surfynol 504 Surfactant
Surfynol 61 Surfactant
Surfynol FS-80 Surfactant
Surfynol FS-85 Surfactant
Surfynol OP-340 Surfactant
Surfynol PSA-204 Surfactant
Surfynol PSA-216 Surfactant
Surfynol PSA-336 Surfactant
Surfynol SE Surfactant
Surfynol SE-F Surfactant

EnviroGem Surfactants

EnviroGem AD01 Surfactant
EnviroGem AE01 Surfactant
EnviroGem AE02 Surfactant
EnviroGem AE03 Surfactant

Dynol High-Performance Surfactant

Dynol 604 Surfactant

Surfynol Antifoams/Defoamers

Acetylenic-Based

Surfynol DF-37 Defoamer
Surfynol DF-110D Defoamer
Surfynol DF-110L Defoamer
Surfynol MD-20 Defoamer
Surfynol PC Surfactant

Silicone-Based

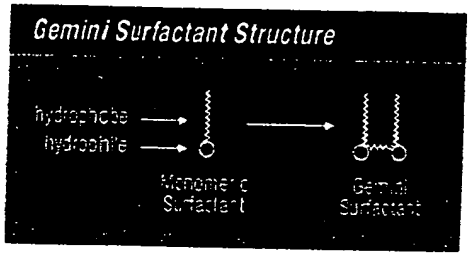
Surfynol DF-58 Defoamer
Surfynol DF-62 Defoamer
Surfynol DF-66 Defoamer
Surfynol DF-574 Defoamer
Surfynol DF-695 Defoamer

Organic-Based

Surfynol DF-70 Defoamer
Surfynol DF-75 Defoamer
Surfynol DF-210 Defoamer

Surfynol Pigment Dispersion Additives

Surfynol CT-111 Surfactant
Surfynol CT-121 Surfactant
Surfynol CT-131 Grind Aid
Surfynol CT-211 Surfactant
Surfynol CT-221 Surfactant
Surfynol CT-231 Surfactant
Surfynol CT-136 Grind Aid
Surfynol CT-141 Dispersant
Surfynol CT-151 Dispersant
Surfynol CT-171 Grind Aid
Surfynol CT-324 Grind Aid
Surfynol GA Surfactant
Surfynol TG Surfactant



For four decades Air Products has been developing specialty additives for waterborne systems based on our proprietary Gemini surfactant technologies. Because they contain two hydrophiles and at least two hydrophobes within a single molecule, Gemini surfactants are more surface-active than their single hydrophile/single hydrophobe analogs. As a result, our Gemini surfactants—Surfynol, Dynol, and EnviroGem additives—are highly efficient, multipurpose and can solve a variety of formulation problems as well as provide specific performance benefits in the systems that include them.

This brochure is intended to give an overview of our complete line of Surfynol, Dynol and EnviroGem additives. Some of these products may not be commercially available in all regions. Please check with your local Air Products office. Additionally, not all of these products are stocked in all regions, so lead time for product delivery may vary.

Surfynol Surfactants

Surfynol 104 Surfactant[1]

Wetting Agent and Defoamer: A nonionic surfactant that has multifunctional benefits, including wetting and foam control, in aqueous systems. Due to its hydrophobic nature, the product has reduced water sensitivity when compared to conventional surfactants.

Surfynol 104
100% waxy solid

Surfynol 104A
50% Surfynol 104 and
50% 2-Ethylhexanol

Surfynol 104BC
50% Surfynol 104 and
50% 2-Butoxyethanol

Surfynol 104DPM
50% Surfynol 104 and
50% Dipropylene Glycol
Monomethyl Ether

Surfynol 104E
50% Surfynol 104 and
50% Ethylene Glycol

Surfynol 104H
75% Surfynol 104 and
25% Ethylene Glycol

Surfynol 104PA
50% Surfynol 104 and
50% Isopropyl Alcohol

Surfynol 104PG-50
50% Surfynol 104 and
50% Propylene Glycol

Surfynol 104S
46% Surfynol 104 and
54% Amorphous Silica

- Solubility: (0.1%) in water at 25 °C
- HLB = 4

Surfynol 2502

Antifoaming Wetting Agent: Surfynol 2502 represents the first in a series of ethoxylated/propoxylated acetylenic-based surfactants that are different from the traditional Surfynol and Dynol products. It offers low dynamic surface tension levels, low pseudo-equilibrium surface tension, excellent foam destabilization, and is extremely low-VOC (1.2%). It is also easy to incorporate and is stable in hard water.

- Surfynol 2502 is a 100% active liquid
- HLB = 7.8

Surfynol 420[1]

Wetting Agent and Defoamer: A nonionic surfactant that functions both as a wetting agent and foam control agent.

- Solubility: 0.1% in water at 25 °C (1.0 g/L)
- HLB = 4
- 1.3 moles EO on Surfynol 104

[1] For specific information on the use of our products in FDA-compliant systems, please visit our website at www.airproducts.com/surfynol.

Surfynol 440[1]

Nonfoaming Wetting Agent: A nonfoaming, nonionic surfactant that is employed for substrate wetting.

- Solubility: 0.15% in water at 25 °C (1.5 g/L)
- HLB = 8
- 3.5 moles EO on Surfynol 104

Surfynol 465[1]

Nonfoaming Wetting Agent: A nonionic, low-foaming surfactant that is utilized for its wetting and slight emulsification properties. Surfynol 465 has a high cloud point for utilization in high-temperature systems.

- Miscible in water
- HLB = 13
- 10 moles EO on Surfynol 104

Surfynol 485[1]

Wetting Agent: A nonionic surfactant that functions as a wetting agent. Surfynol 485 also has slight emulsification properties.

- Soluble in water
- HLB = 17
- 30 moles EO on Surfynol 104

Surfynol 485W[1]

Wetting Agent: A nonionic surfactant that functions as a wetting agent. The product also has slight emulsification properties. Surfynol 485W is an 85% solution of Surfynol 104 in water with lower viscosity and easier handling properties.

- Soluble in water
- HLB = 17
- 30 moles EO on Surfynol 104

Surfynol 502[1]

Nonfoaming Wetting Agent: An acetylenic diol-based, nonionic and anionic blend wetting agent designed to provide excellent, defect-free coverage over the most difficult-to-wet substrates in aqueous systems. In certain systems, Surfynol 502 acts as a moderate defoamer and flow/leveling agent. Primary applications are those over low-energy substrates such as plastics, metals, wood and previously coated materials.

- Surfynol 502 is a 78% active liquid

Surfynol 504[1]

Nonfoaming Wetting Agent: An acetylenic diol-based, nonionic and anionic blend wetting agent designed to provide excellent, defect-free coverage over the most difficult-to-wet substrates in aqueous systems. Primary applications are those over low-energy substrates such as plastics, metal, wood and previously coated materials.

- Surfynol 504 is an 80% active liquid

Surfynol 61

Wetting Agent and Defoamer: A volatile, nonionic surfactant that functions as a wetting agent and defoamer. The product evaporates at room temperature to reduce water sensitivity and other undesirable surfactant side effects. The product is also useful as an alcohol and glycol ether replacement.

- Product is a 100% active liquid
- Solubility: 0.9% in water at 20 °C (9.0 g/L)
- HLB = 5–6

Surfynol FS-80

Wetting Agent: A solvent-free, low-foaming wetting agent specifically designed for incorporation into lithographic fountain solutions. Based on acetylenic chemistry, this surfactant provides important wetting and emulsification properties in fountain solutions while eliminating the need for alcohols. Additionally, the product is environmentally friendly with ultra-low VOCs and low odor.

- Soluble in water

Surfynol FS-85

Wetting Agent: A solvent-free, low-foaming wetting agent specifically designed for incorporation into lithographic fountain solutions. Based on acetylenic chemistry, this surfactant provides important wetting and emulsification properties in fountain solutions while eliminating the need for alcohols. Additionally, the product is environmentally friendly with ultra-low VOCs and low odor.

- Soluble in water

Surfynol OP-340

Wetting Agent: A liquid product designed to be compatible and perform well with the various acrylic resins commercially utilized in aqueous overprint varnishes (OPV). The product was developed specifically to provide low surface tension and excellent substrate wetting at competitive formula costs for aqueous overprint varnishes over wet or dry lithographic inks.

- Slightly soluble in water

Surfynol PSA-204[1]

Low-Foaming Wetting Agent: A low-foam wetting agent based on proprietary acetylenic diol technology designed to solve formulating problems in water-based pressure-sensitive adhesive applications, especially in SBR latex adhesives. The product provides excellent wetting with minimal effect on final adhesive properties.

Surfynol PSA-216[1]

Wetting Agent and Defoamer: A defoaming wetting agent based on proprietary acetylenic diol technology designed to solve formulating problems in water-based pressure-sensitive adhesive applications, especially in both acrylic and vinyl acrylic adhesives. The product provides excellent wetting with minimal effect on final adhesive properties.

- Soluble in water

[1] For specific information on the use of our products in FDA-compliant systems, please visit our website at www.airproducts.com/surfynol.

Surfynol PSA-336[1]

Wetting Agent: A powerful solvent-free wetting agent with moderate foaming tendencies, based on proprietary acetylenic diol technology. The product offers the lowest dynamic surface tension and is designed to provide the appropriate balance between wetting agent and defoamer that is required for water-based pressure-sensitive and laminating adhesive applications, especially in gravure applications for labels.

- Moderately soluble in water

Surfynol SE

Wetting Agent and Defoamer: Surfynol SE is a nonionic defoaming surfactant which can act as a highly effective wetting agent, defoamer and viscosity stabilizer and often performs more than one of these functions in combination.

- Surfynol SE is an 80% active liquid
- Solubility: 0.14% in water at 25 °C (1.4 g/L)
- HLB = 4–5

Surfynol SE-F[1]

Wetting Agent and Defoamer: Surfynol SE-F is a nonionic self-emulsifiable surfactant that will reduce surface tension and control foam. This product's self-emulsifiable nature improves ease of addition into water-based systems.

- Surfynol SE-F is an 80% active liquid
- Solubility: 0.14% in water at 25 °C (1.4 g/L)
- HLB = 4–5

EnviroGem Surfactants

EnviroGem AD01

Defoaming Wetting Agent: A 100% active, liquid, low-odor, APE-free and HAPs-free nonionic surfactant. EnviroGem AD01 surfactant demonstrates fast knockdown defoaming, foam control and wetting in many applications.

- HLB = 4
- Chemical stability from pH 3–13

EnviroGem AE01

Low-Foam Wetting Agent: A 100% active, low-foam wetting agent that has shown superior flow and leveling properties in many waterborne systems. EnviroGem AE01 surfactant can be used to minimize defects caused by entrained air or poor wetting, such as orange peel, cratering, pigment settling and low gloss. EnviroGem AE01 surfactant is classified as readily biodegradable by both OECD 306 (marine) and OECD 301A-F (fresh water), which makes it ideal for environmentally sensitive applications.

- HLB = 5
- Solubility: 0.2 wt % in water at 25 °C (2.0 g/L)

EnviroGem AE02

Low-Foam Wetting Agent: A 100% active, low-foam wetting agent that has shown superior flow and leveling properties in many waterborne systems. EnviroGem AE02 surfactant can be used to minimize defects caused by entrained air or poor wetting, such as orange peel, cratering, pigment settling and low gloss. EnviroGem AE02 surfactant is classified as readily biodegradable by both OECD 306 (marine) and OECD 301A-F (fresh water), which makes it ideal for environmentally sensitive applications.

- HLB = 4
- Solubility: 0.05 wt % in water at 25 °C (0.5 g/L)

EnviroGem AE03

Low-foam Wetting Agent: A 100% active, low-foam wetting agent that has shown superior flow and leveling properties in many waterborne systems. EnviroGem AE03 surfactant can be used to minimize defects caused by entrained air or poor wetting, such as orange peel, cratering, pigment settling and low gloss. EnviroGem AE03 surfactant is classified as readily biodegradable by both OECD 306 (marine) and OECD 301A-F (fresh water), which makes it ideal for environmentally sensitive applications.

- HLB = 4
- Solubility: 0.05 wt % in water at 25 °C (0.5 g/L)

Dynol High-Performance Surfactant

Dynol 604

Ultra Wetting Agent: A low-VOC, low-foam, nonionic wetting agent ideal for high-performance waterborne applications. The product offers an excellent balance of properties, generally not found in fluoro or silicone surfactants, making it an alternative for difficult-to-wet-substrates requiring good flow and leveling. This wetting agent has the ability to reduce both equilibrium and dynamic surface tension to a degree not found with other surfactants.

- Dynol 604 is a 100% active liquid
- Equilibrium surface tension: 26 dynes/cm in water at 0.05% (0.5 g/L)
- Dynamic surface tension: 28 dynes/cm in water
- Solubility: <0.1% in water at 25 °C (1.0 g/L)

Surfynol Antifoams/Defoamers

Acetylenic-Based

Surfynol DF-37[1]

Defoamer: A nonionic, acetylenic-based defoamer which promotes foam control as well as surface wetting. This product was developed for use during latex glove and waterborne coating dipping applications to eliminate web formation while minimizing surface defects. Other applications include inks, adhesives and paints.

- Emulsifiable in water

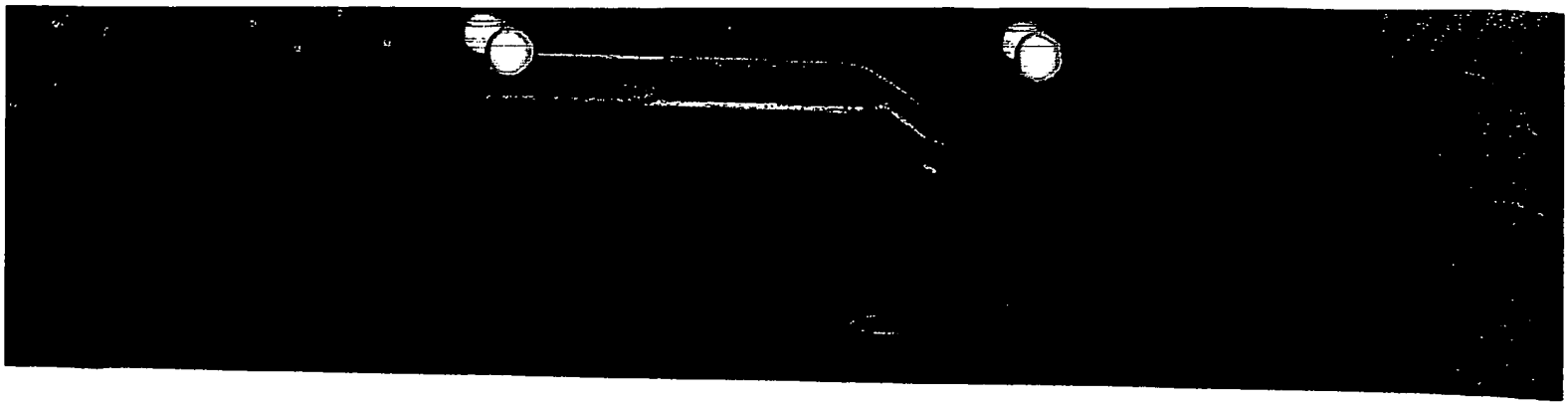
Surfynol DF-110D and DF-110L

Defoamer: A nonionic, nonsilicone acetylenic-based product useful for defoaming in aqueous systems without the side effects typical of many foam control agents. The product is also a deairentrainment agent in aqueous high-solids systems.

Surfynol DF-110D and DF-110L are liquid products solubilized in low-molecular-weight glycols.

- Solubility: 0.03% in water at 25 °C (0.3 g/L)
- HLB = 3

[1] For specific information on the use of our products in FDA-compliant systems, please visit our website at www.airproducts.com/surfynol.



Surfynol MD-20[2]

Molecular Defoamer: A 100% active, nonsilicone, liquid product based on Gemini surfactant technology. This is a unique multifunctional defoamer, providing a combination of foam control and dynamic wetting, offering formulators the potential to reduce overall additive levels while further reducing surface defects. Used alone or in combination with other Surfynol wetting agents, Surfynol MD-20 is exceptionally effective at eliminating microfoam and other foam-related defects.

Surfynol PC

Defoamer: A nonsilicone defoamer and pigment shock reducer for paper coating formulations. Surfynol PC is extremely stable, retaining its defoaming activity even during recycling of the formulation. Surfynol PC defoamer may also be used in pigmented systems, such as paints, and in systems where foaming influence is a water-soluble polymer.

Silicone-Based

Surfynol DF-58

Defoamer: Surfynol DF-58 is a silicone-based foam control agent useful in aqueous systems, especially in industrial maintenance coatings and wood coatings. The product has strong foam control and deairation performance. In addition, the product has been modified to prevent surface defects caused by many conventional defoamers.

- Surfynol DF-58 is a 100% active liquid
- Emulsifiable in water

Surfynol DF-62

Defoamer: An ether-modified polysiloxane-based defoamer. The product is designed to provide excellent knockdown defoaming and sustained antifoaming over time. Appropriate applications include waterborne wood coatings, industrial maintenance coatings, printing inks and pigment grind applications.

- Surfynol DF-62 is a 100% active liquid
- Emulsifiable in water

Surfynol DF-66

Defoamer: An acetylenic-modified, polysiloxane-based emulsion defoamer. The product is designed for use in aqueous ink systems. It is recommended for use in pigment grinding and letdown applications. Surfynol DF-66 defoamer provides an excellent balance of initial knockdown and sustained defoaming with no detrimental effects on printability in a water-based ink system.

- Surfynol DF-66 is a 46% active liquid
- Emulsifiable in water

Surfynol DF-574

Defoamer: A self-emulsifying product formulated with organic and organo-modified silicone components. The product was designed as a rapid knockdown defoamer for use in aqueous coatings and inks. Surfynol DF-574 defoamer can provide effective removal of entrained air and foam generated during the manufacture of water-based coatings and inks.

- Emulsifiable in water

Surfynol DF-695[1]

Defoamer: A silicone emulsion defoamer designed for water-based coatings and inks. The product is effective in both the grind step and letdown. It is particularly useful in acrylic-resinated systems.

- Emulsifiable in water

Organic-Based

Surfynol DF-70[1]

Defoamer: An organic-based defoamer designed specifically for water-based formulations. The product is an effective knockdown and sustained antifoamer. It is particularly suited for use in acrylic and styrene-acrylic systems.

- Product is a 100% active liquid and should be mixed prior to use
- Dispersible in water

Surfynol DF-75[1]

Defoamer: An oil-free, nonsilicone defoamer designed for aqueous systems. The product is an effective knockdown and sustained defoamer. It is particularly beneficial in acrylic-resinated systems.

- Product is a 100% active liquid
- Emulsifiable in water

Surfynol DF-210

Defoamer: A nonsilicone defoamer developed for aqueous coatings and inks. It is especially useful in systems to be applied over absorbent substrates. The product is useful in the letdown for long-term foam control.

- Dispersible in water

Surfynol Pigment Dispersion Additives

Surfynol CT-111

Pigment Grind Aid and Wetting Agent: A low-foaming, solvent-free, nonionic additive designed as both a substrate wetting agent and as a grind aid for low-HLB pigments. As a pigment grind aid, Surfynol CT-111 should be used in conjunction with an anionic dispersant or grind resin. As a substrate wetting agent, the product improves coverage and flow properties.

- Solubility: 0.5% in water at 25 °C (5 g/L)
- HLB = 8–11

Surfynol CT-121

Pigment Grind Aid: A low-foaming, solvent-free, nonionic grind aid specifically designed for wetting organic pigments of mid-range HLB values. Surfynol CT-121 promotes maximum color strength while reducing the required grind time. The product should be used in conjunction with an anionic dispersant or grind resin.

- Miscible in water
- HLB = 11–15

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[1] For specific information on the use of our products in FDA-compliant systems, please visit our website at www.airproducts.com/surfynol.

[2] Commercial quantities of this material are supported by [illegible]

Surfynol CT-131

Pigment Grind Aid and Dispersant: A solvent-free, nonionic/anionic grind aid designed for aqueous pigment wetting and dispersion. Surfynol CT-131 is recommended for high-HLB organic pigments and all inorganic pigments. The product is also useful in dispersions of the universal type. Surfynol CT-131 can be utilized in conjunction with a grind resin or for "resin-free" grinding.

- Miscible in water
- HLB = 11–20

Surfynol CT-211

Pigment Grind Aid and Wetting Agent: A nonionic additive designed for both pigment and hydrophobic substrate wetting. It is both solvent-free and APE-free. As a pigment grind aid, it is suitable for use with hydrophobic pigments, due to its relatively low HLB value (8–11). As a wetting agent, it finds use in water-based coatings, inks, adhesives and many other systems. Use levels will be between 0.1% and 3.0% on total formulation for wetting applications and between 3% and 15% on dry pigment weight, depending on the pigment used. It is commonly formulated in combination with anionic surfactants, such as Surfynol CT-141 or water-soluble grind resins.

- HLB = 8–11

Surfynol CT-221

Pigment Grind Aid: A nonionic grind aid, specifically designed for pigment wetting and stabilization. It is both solvent-free and APE-free and is suitable for use with pigments that have mid-range HLB (11–15) values. Surfynol CT-221 provides low viscosity at high pigment loadings and excellent dispersion stability in resin-free and resin-containing grinds. Use levels will be between 3% and 15% on dry pigment weight, depending on pigment used.

- HLB = 11–5

Surfynol CT-231

Pigment Grind Aid and Dispersant: A solvent-free and APE-free, nonionic/anionic grind aid. It is designed for aqueous pigment wetting and dispersion. Surfynol CT-231 is suitable for use with pigments with a wide-range of HLB values (8–20) for formulating resin-free grinds. Surfynol CT-231 provides low viscosity at high pigment loadings and excellent dispersion stability. Use levels will be between 3% and 15% on dry pigment weight, depending on the pigment used. It is commonly formulated in combination with anionic surfactants, such as Surfynol CT-141, or hydrophilic high-density pigments, such as iron oxides or titanium oxides.

- HLB = 8–12

Surfynol CT-136

Pigment Grind Aid and Dispersant: A highly formulated product to aid in low-foam grinding, dispersion and viscosity control of pigments in aqueous media. The product is also recommended for grinding and dispersing universal tint bases, regardless of pigment type. Surfynol CT-136 can be employed with resin or in resin-free grinds. The grind aid is suitable with high-HLB organic and all inorganic pigments.

- Miscible in water
- HLB = 11+

Surfynol CT-141

Dispersant: Low-molecular-weight dispersant designed to aid in aqueous pigment dispersion or to control viscosity in a finished system. The product is anionic for highly efficient charged stabilization. This product is commonly used as a post-add in waterborne inks.

- Soluble in water

Surfynol CT-151

Dispersant: A highly efficient anionic pigment dispersant that, when included in waterborne industrial coatings and inks, leads to reduced grind viscosity and particle size. Surfynol CT-151 dispersant has no deleterious effect on gloss or corrosion resistance and provides excellent viscosity/dispersion stability and low process/application foam.

- Soluble in water

Surfynol CT-171

Pigment Grind Aid and Dispersant: A solvent-free anionic/nonionic grind aid designed to provide both effective pigment wetting and dispersing characteristics for many types of organic pigments. The product provides long-term dispersion and finished ink viscosity stability, especially in troublesome pigments such as lithol rubine. Surfynol CT-171 is effective for both resin and resin-free dispersions.

- Soluble in water

Surfynol CT-324

Pigment Grind Aid and Dispersant: A formulated additive designed to facilitate the dispersion of titanium dioxide and other inorganic pigments. The product can give high-solids dispersion at optimal viscosities, with low foam. The product can be used alone or with other dispersants.

- Miscible in water
- HLB = 13+

Surfynol GA

Pigment Grind Aid: A blend of nonionic surfactants designed as a grinding aid for organic pigments of mid-HLB range. Surfynol GA rapidly wets out the pigment and controls mill-base foam and viscosity. The product is used in conjunction with anionic dispersants and grind resins.

- Miscible in water
- HLB = 13+

Surfynol TG

Pigment Grind Aid and Wetting Agent: A low-foaming nonionic surfactant blend useful for substrate wetting and as a grind aid in low-HLB pigment dispersion. As a pigment grind aid, Surfynol TG is used and is compatible with anionic surfactants or grind resins. The product will also prevent water spotting in water rinses. Surfynol TG shows excellent curtain stability in curtain coating applications.

- Solubility: 0.5% in water at 25 °C (5.0 g/L)
- HLB = 9–10

AIR PRODUCTS

For Samples or More Information

If you would like additional information or technical assistance in preparing specific formulations, write or call Air Products and Chemicals, Inc. at the following locations.

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PERSONAL CARE

Personal Care | Nonionic Surfactants

1:1 Diethanolamides

Amide:85%	Coconut
: Liquid	

Applications: Economical foam boosters and viscosifier. Used in shampoos, bubble baths, liquid hand and boc and household and institutional cleaners.

1:1 Diethanolamides

Amide:95%	Coconut
: Liquid	

Applications: High performance cosmetic grade amides. Exceptional viscosity builders in high foaming shampc products.

1:1 Diethanolamides

Amide:85%	Linoleic
: Liquid	

Applications: Superfatting agent. Extremely effective thickener for low active shampoo, bubble bath and hand : conditioning properties to hair and skin products.

1:1 Diethanolamides

Amide:95%	Lauric
: liquid	

Applications: Outstanding foam boosting and stabilization. Greatly enhances viscosity and performance in han shampoos and related cosmetics.

1:1 Monoethanolamides

Amide:88%- 96%	Coconut
: Flakes	

Applications: Adds opacity, thickening, foam boosting, foam stabilization and mildness. Used in solid detergen controlled release cleaners.

1:1 Monoethanolamides

Amide:95%	Lauric
: Flakes	

Applications: Useful in foaming bath powders.

1:1 Monoethanolamides

Amide:95%	Stearic
: Flakes	

Applications: High melting point. Very mild. Binder and conditioner for syndet and combo bar soaps. Stabilizes institutional laundry powder to high use temperatures.

2:1 Alkanolamides

Amide:72%	Coconut
: Liquid	

Applications: Versatile foam booster, stabilizer and viscosifier for shampoos, bubble baths, powdered and liqui

Aromatic Ethoxylates

5.0	<20
HLB: 10.0	

Applications: Anti-icing additive for gasoline. Solubilizer/dispersant for hair colorants. Used in every type of de phases of aqueous textile, pulp and paper processing. Also for industrial metal cleaners, floor cleaners and sa emulsifier for nonpolar solvent emulsion cleaners, detergents, floor cleaners and floor polishes.

Castor Oil Ethoxylates

Chemical/CTFA Name:PEG-15 Castor Oil	Molecular Weight:1600

EO Content,wt%: 41.3	HLB: 8.2
Hydroxyl Number: 105	Water Solubility: Insoluble
Applications: Emulsifier, viscosity control agent, dispersant, lubricant, solubilizing agent, emollient.	

Castor Oil Ethoxylates

Chemical/CTFA Name:PEG-20 Castor Oil	Molecular Weight:1820
EO Content,wt%: 48.4	HLB: 9.7
Hydroxyl Number: 92	Water Solubility: Insoluble
Applications: Emulsifier, wetting agent, dispersant, lubricant, solubilizing agent, metal processing.	

Castor Oil Ethoxylates

Chemical/CTFA Name:PEG-30 Castor Oil	Molecular Weight:2260
EO Content,wt%: 58.4	HLB: 11.7
Hydroxyl Number: 74.5	Water Solubility: Insoluble
Applications: Emulsifier, softener, dispersant, lubricant, solubilizing agent and rewetting agent.	

Castor Oil Ethoxylates

Chemical/CTFA Name:PEG-25 Castor Oil	Molecular Weight:2040
EO Content,wt%: 53.9	HLB: 10.7
Hydroxyl Number: 82.5	Water Solubility: Insoluble
Applications: Emulsifier, softener, dispersant, lubricant, solubilizing agent and rewetting agent.	

Castor Oil Ethoxylates

Chemical/CTFA Name:PEG-60 Castor Oil	Molecular Weight:3580
EO Content,wt%: 73.7	HLB: 14.7
Hydroxyl Number: 47	Water Solubility: Soluble
Applications: Emulsifier, emollient, dispersant, antistat, lubricant, solubilizing agent, superfatting agent and sof	

Nonionics with Ester Groups

Flakes	60-67 C
HLB: 1.4	Chemical/CTFA Name: Glycol Distearate (I
Applications: Opacifier and pearlizing agent in personal care and detergent systems.	

Nonionics with Ester Groups

Flakes	57-61C
HLB: 2.7	Chemical/CTFA Name: Glycerol Stearate (
Applications: Pearlizing agents in shampoos, liquid hand and body soaps, and liquid detergents. Emulsion stal	

Nonionics with Ester Groups

Flakes	58-63C
HLB: 4.5	Chemical/CTFA Name: Glycerol Stearate
Applications: Lipophilic emulsifier for creams, lotions, sunscreens and antiperspirants. Opacifies and thickens.	

Nonylphenol Ethoxylate

1.5	<20
HLB: 4.6	
Applications: Extremely oil soluble surfactant and intermediate. Stabilizes foam at low levels and defoams at h emulsifier in surfactant concentrates. Emulsion stabilizer. Oil soluble detergent and dispersant for petroleum oi	

Nonylphenol Ethoxylate

6	<20
HLB: 10.8	
Applications: Borderline oil and water solubility. Intermediate to anionic surfactants. Emulsifiers and coupling a emulsifier for mineral oil, silicones and agricultural compounds.	

Nonylphenol Ethoxylate

4	<20
HLB: 8.8	
Applications: Plasticizer and antistat for PVAc. Freeze-thaw stabilizer for latices. Oil soluble detergent/dispers	

Nonylphenol Ethoxylate

30	74-78 1% in 10% NaCl
HLB: 17.2	
Applications: Used in high temperature scouring of textiles. Solubilizer for toxaphene, kerosene and essential	

Peq Esters, Ethoxylated Acids and Oils

Liquid	HLB:7.2

Chemical/CTFA Name: PEG-8 Dioleate	
Applications: Oil soluble emulsifier for defoamers and fiber finishes. Adds lubricity. Co-emulsifiers and opacifie	

Peq Esters, Ethoxylated Acids and Oils

Liquid	HLB:11.0
Chemical/CTFA Name: PEG-8 Oleate	
Applications: Emulsifier for fats. Useful in straight oils and soluble oils.	

Peq Esters, Ethoxylated Acids and Oils

Liquid	HLB:10.0
Chemical/CTFA Name: PEG-12 Dioleate	
Applications: Emulsifier/solubilizer for oils, fats and solvents in metal working fluids, textile lubricants and pesti	

Peq Esters, Ethoxylated Acids and Oils

Viscous Liquid	HLB:12.0
Chemical/CTFA Name: PEG- 30 Castor Oil	
Applications: Emulsifier for fats, oils, fatty acids, waxes and solvents. Dispersant for pigments and iron powder fluids. Paper dye-leveling agent. Softening and rewetting agent for wet strength paper. Stabilizer for PVAc em degreasers and fat liquoring. Maintains viscosity of water-emulsion paints over wide temperature range. Emuls binders. Co-emulsifier for fabric softners and dye carriers.	

Peq Esters, Ethoxylated Acids and Oils

Solid	HLB:13.6
Chemical/CTFA Name: PEG-40 Castor Oil	
Applications: Used to emulsify vitamins and other pharmaceuticals. Other uses similar to PEG-30 Castor Oil.	

Peq Esters, Ethoxylated Acids and Oils

Liquid	HLB:18.3
Chemical/CTFA Name: PEG-200 Castor Oil	
Applications: Effective emulsifier for mineral oil, triglycerides and alkyl esters. Textile antistat, lubricant and dy	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:16.7
Chemical/CTFA Name: Poly Sorbate 20	
Applications: Emulsifiers/solubilizes vitamin oils, essential oils, balsam, fragrances and tars in cosmetics and p as a thickener for shampoos and nylon spin finishes. Emulsifier for dye carriers.	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:18.3
Chemical/CTFA Name: PEG-80 Sorbitan Laurate	
Applications: Reduces irritancy of baby shampoos and children's bath care products.	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:15.0
Chemical/CTFA Name: Polysorbate 80	
Applications: Emulsifies fatty alcohols in tobacco sucker control agents. Versatile O/W emulsifier. Co-emulsifie for petroleum oils, fats, solvents and waxes.	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:11.0
Chemical/CTFA Name: Polysorbate 85	
Applications: Emulsifier/co-emulsifier for oils, fats and waxes. For textile, leather , fiberglass, metal lubricants a	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:8.6
Chemical/CTFA Name: Sorbitan Monolaurate	
Applications: Water dispersible emulsifier for oils and fats in cosmetics and industrial products. Also used as lu for PVC.	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Liquid	HLB:4.3
Chemical/CTFA Name: Sorbitan Monooleate	
Applications: Versatile oil soluble emulsifier/coupler for medicines, oils, fats, and waxes in cosmetic, textile and Pigment dispersant in lipsstick, eyeliners, mascaras, etc. Used in oil-based ointments, creams and lotions to in reduce greasiness.	

Sorbitol Esters and Ethoxylated Sorbitol Esters

Solid Beads	HLB:4.7
Chemical/CTFA Name: Sorbitan Monostearate	

Applications: Water/oil emulsifier used in creams, lotions and mkeup preparations. Also serves as a textile lub	
Sorbitol Esters and Ethoxylated Sorbitol Esters	
Liquid	HLB:1.8
Chemical/CTFA Name: Sorbitan Trioleate	
Applications: Used to formulate textile and leather softeners. Coupler and co-emulsifier for mineral oil.	

50 Industrial Circle, Lincoln, RI USA 02865, 401-722-2410